CLAIMS

1. In a lifting foil having an upper course extending sideward between an upper starboard end and an upper port end, and a lower course extending sideward between a a lower starboard end situated opposite a lower port end; said courses being immersed in a fluid medium and in relative movement therewith in a first direction, X; the method of reducing spanwise flow of said fluid in a second direction, Y, perpendicular to X comprising the steps of:

(1) constructing a starboard flow guide comprising an upper section , a mid-section disposed alongside said upper section and a lower section disposed alongside said mid-section, opposite said upper section,

(2) attaching said starboard flow guide between the starboard ends of said upper and lower courses by blended connection therewith,

(3) constructing a port flow guide comprising an upper section , a mid- section disposed alongside said upper section and a lower section disposed alongside said mid-section, opposite said upper section, and

(4) attaching said port flow guide between the port ends of said upper and lower courses by blended connection therewith,

2. A method according to claim 1 wherein said flow guides have cambered surfaces configured for reducing dynamic pressures from maximum values at said upper and lower sections to minimum values at said mid-sections.

3 A method according to claim 2 wherein said minimum values at said mid-sections are substantially zero.

4. In a lifting foil the combination of:

(a) A lower course having a lower starboard margin and a lower port margin, said lower course extending sideward between said lower starboard margin and said lower port

margin for generating a first fluid reaction force having an upwardly directed lifting component,

(b) An upper course having an upper starboard margin and an upper port margin, said upper course being positioned above said lower course and extending sideward between said upper starboard margin and said upper port margin for generating a second fluid reaction force having an upwardly directed lifting component,

(c) A starboard flow guide extending vertically between said lower starboard margin and said upper starboard margin, for suppressing starboard-side vortex generation , and

(d) A port flow guide extending vertically between said lower port margin and said upper port margin, for suppressing port-side vortex generation.

5. A lifting foil according to claim 4, wherein said flow guides are secured to said courses by smooth, continuous connections which blend into said courses at said margins

6. A lifting foil according to claim 5 further comprising,

(e) means defining a plurality of boundary lines and a plurality of surfaces bounded by said plurality of boundary lines.

7. A lifting foil according to claim 6 wherein said plurality of boundary lines are 4 in number.

8. A lifting foil according to claim 7 wherein said plurality of surfaces are 3 in number.

9. A lifting foil according to claim 8 wherein said lifting foil has a vertical crossection which is generally elliptical.

10. A lifting foil according to claim 9 wherein said vertical crossection has a ratio of major axis to minor axis ranging between 1.6 and 10.5.

11. A lifting foil according to claim 9 wherein said vertical crossection has a ratio of major axis to minor axis which is approximately 3.0.

12. A lifting foil according to claim 9 wherein said upper course is rearwardly offset from said lower course.

13. A lifting foil according to claim 9 wherein said fuselage is situated midway between said flow guides, said lifting foil being provided with a large starboard passage situated between said fuselage and said starboard flow guide, and a large port passage situated between said fuselage and said port flow guide.

14. A lifting foil according to claim 8 said three surfaces comprising a first surface defining said port passage, a second surface defining said starboard passage and a third surface defining the exterior shape of said lifting foil.

15 A lifting foil according to claim 14, said fuselage being enclosed by cooperative coverage from said first, second and third surfaces.

16 A lifting foil comprising.:

(a) A lower course having a lower starboard margin and a lower port margin, said lower course extending sideward between said lower starboard margin and said lower port margin for generating a first fluid reaction force having an upwardly directed lifting component,

(b) An upper course having an upper starboard margin and an upper port margin, said upper course being positioned above said lower course and extending sideward between said upper starboard margin and said upper port margin for generating a second fluid reaction force having an upwardly directed lifting component,

c) A starboard flow guide extending vertically between said lower starboard margin and said upper starboard margin, for suppressing starboard-side vortex generation ,

(d) A port flow guide extending vertically between said lower port margin and said upper port margin, for suppressing port-side vortex generation, and

(e) Said lower course having a keel-shaped underside to provide a sideslip-reducing dihedral angle.

17. A lifting foil comprising

(a) A lower course having a lower starboard margin and a lower port margin, said lower course extending sideward between said lower starboard margin and said lower port margin for generating a first fluid reaction force having an upwardly directed lifting component,

(b) An upper course having an upper starboard margin and an upper port margin, said upper course being positioned above said l however course and extending sideward between said upper starboard margin and said upper port margin for generating a second fluid reaction force having an upwardly directed lifting component,

(c) A starboard flow guide extending vertically between said lower starboard margin and said upper starboard margin, said starboard flow guide compising:

(i) a first upper section secured to said upper starboard margin,

(ii) a first lower section secured to said lower starboard margin, and

(iv) a first mid-section positioned between said first upper section and said first lower section,

(d) A port flow guide extending vertically between said lower port margin and said upper port margin, said port flow guide compising:

(i) a second upper section secured to said upper port margin,

(ii) a second lower section secured to said lower port margin, and

(iv) a second mid-section positioned between said second upper section and said second lower section,

18. A lifting foil according to claim 17 wherein said starboard flow guide and said port flow guide are cambered to suppress spanwise fluid flow.

19. A lifting foil according to claim 17 wherein said upper course is offset upwardly and rearwardly .of said lower course.

20. A lifting foil according to claim 19 wherein said upper course is swept forwardly on two sides of a centerline extending in an X-direction through said lifting foil, and said lower course is swept rearwardly on two sides of said centerline..

21. A method of suppressing vortices at tips of upper and lower biplane wings comprising the steps of:

(1) collecting fluid flowing spanwise at said tips, and

(2) directing collected fluid to common termination points between adjacent wing tips.

22. Method of vortex suppression according to claim 21 further comprising the step of progressively reducing the dynamic pressure of fluid being directed to said termination points.